

RESPONSE TO RESTRICTION AND ELECTION OF SPECIES REQUIREMENTS AND PRELIMINARY AMENDMENT

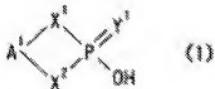
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U.S. Application No.: 10/587,279

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Withdrawn) A process for producing an amine, which comprises reacting an imine compound and a nucleophilic compound (provided that a trialkylsilyl vinyl ether is excluded) in the presence of a phosphoric acid derivative represented by the formula (1):



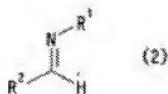
(wherein A¹ represents a spacer; X¹ and X² each independently represent a divalent nonmetal atom or a divalent nonmetal atomic group; and Y¹ represents an oxygen atom or a sulfur atom).

2. (Withdrawn) The process according to claim 1, wherein the phosphoric acid derivative represented by the formula (1) is an optically active phosphoric acid derivative, and the obtained amine is an optically active amine.

3. (Withdrawn) The process according to claim 1, wherein the imine compound is an imine compound represented by the formula (2) :

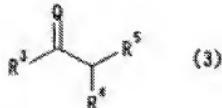
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(wherein R¹ represents a hydrogen atom or a protective group, and R² represents a group having no α-proton or an unsaturated hydrocarbon group).

4. (Withdrawn) The process according to claim 1, wherein the nucleophilic compound is a compound represented by the formula (3):



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having substituent(s) or a hydroxy group; and Q represents a group giving a tautomer of a compound represented by the formula (3); and R³ and R⁴, R³ and R⁵, or R⁴ and R⁵ may be taken together to form a ring);

a compound represented by the formula (5):



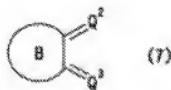
(wherein R⁷ represents a hydrogen atom, a hydrocarbon group optionally having substituent(s), a heterocyclic group optionally having substituent(s), an alkoxy group optionally having substituent(s), an aryloxy group optionally having substituent(s) or an aralkyloxy group optionally having substituent(s), an alkylthio group optionally having substituent(s), an arylthio group optionally having substituent(s), an aralkylthio group optionally having substituent(s) or EWG² (EWG² represents an electron-withdrawing group); and Z¹ represents N₂, P(R⁸)₃ (three of R⁸ the same or different represent a hydrogen atom, a hydrocarbon group optionally having substituent(s), a heterocyclic group optionally having substituent(s), an alkoxy group optionally having substituent(s), an aryloxy group optionally having substituent(s) or an aralkyloxy group optionally having substituent(s)), or CR⁹R¹⁰ (R⁹ and R¹⁰ each independently represent a hydrogen atom, a hydrocarbon group optionally having substituent(s), a heterocyclic group optionally having substituent(s), an alkoxy group optionally having substituent(s), an aryloxy group optionally having substituent(s), an aralkyloxy group optionally having substituent(s), an alkylthio group optionally having substituent(s), an arylthio group optionally having substituent(s), an aralkylthio group optionally having substituent(s), or CR⁹R¹⁰).

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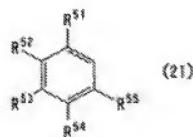
having substituent(s), an arylthio group optionally having substituent(s), an aralkylthio group optionally having substituent(s), an amino group or a substituted amino group; provided that either one of R⁹ and R¹⁰ represents an alkoxy group optionally having substituent(s), an aryloxy group optionally having substituent(s), an aralkyloxy group optionally having substituent(s), an alkylthio group optionally having substituent(s), an arylthio group optionally having substituent(s), an aralkylthio group optionally having substituent(s), an amino group or a substituted amino group);

a compound represented by the formula (7):



(wherein ring B represents an aliphatic ring or an aliphatic heterocycle; and Q² and Q³ each independently represent an oxygen atom, NR¹⁷ (R¹⁷ represents a hydrogen atom or a protective group) or a sulfur atom); or

a benzene represented by the formula (21):

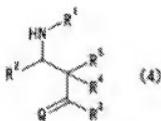


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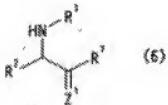
(wherein R⁵¹ to R⁵⁵ each independently represent a hydrogen atom or a substituent;
provided that R⁵¹ and R⁵², R⁵² and R⁵³, R⁵³ and R⁵⁴, or R⁵⁴ and R⁵⁵ may be taken together to form a
ring).

5. (Withdrawn) The process according to claim 1, wherein the obtained amine is
an amine represented by formula (4):



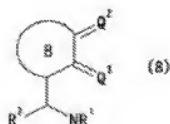
(wherein R¹ to R⁵ and Q are the same as defined above);

an amine represented by the formula (6):



(wherein R¹, R², R⁷ and Z¹ are the same as defined above);

an amine represented by the formula (8):

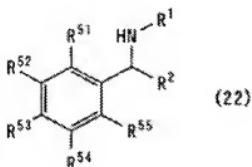


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(wherein R¹, R², Q² and Q³ are the same as defined above); or

a compound represented by the formula (22):



(wherein R¹, R² and R⁵¹ to R⁵⁵ are the same as defined above).

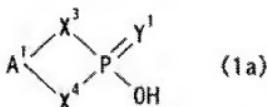
6. (Withdrawn) The process according to claim 5, wherein the amine represented by the formula (4), (6), or (8) is an optically active amine.

7. (Withdrawn) The process according to claim 1, wherein the divalent nonmetal atom or the divalent nonmetal atomic group represented by X¹ and X² in the formula (1) is an oxygen atom, -NR¹³- (R¹³ represents a hydrogen atom, a hydrocarbon group optionally having substituent(s) or an acyl group optionally having substituent(s)), a sulfur atom or -CR¹⁵R¹⁶- {R¹⁵ and R¹⁶ each independently represent a hydrogen atom, a hydrocarbon group optionally having substituent(s) or EWG³ (EWG³ represents an electron-withdrawing group); provided that either one of R¹⁵ and R¹⁶ is EWG³}.

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8. (Currently amended) A phosphoric acid derivative represented by the formula (la):



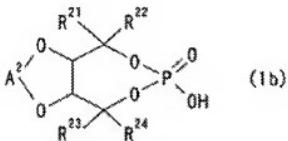
(wherein A¹ represents a spacer; X³ and X⁴ each independently represent an oxygen atom, -NR¹³- (R¹³ represents a hydrogen atom, a hydrocarbon group optionally having substituent(s) or an acyl group optionally having substituent(s)), a sulfur atom or -CR¹⁵R¹⁶ {R¹⁵ and R¹⁶ each independently represent a hydrogen atom, a hydrocarbon group optionally having substituent(s) or EWG³ (EWG³ represents an electron-withdrawing group); provided that either one of R¹⁵ and R¹⁶ is EWG³}; and Y¹ represents an oxygen atom or a sulfur atom, provided that when i) X³=X⁴, then X³ and X⁴ are each -NR¹³- (R¹³ is a hydrogen atom, a hydrocarbon group optionally having a substituentsubstituent or an acyl group optionally having substituent(s)), a sulfur atom or -CR¹⁵R¹⁶-, or when X³ and X⁴ are each -NR¹³-), then the -NR¹³- is -NR^a- (R^a represents an acyl group derived from sulfonic acid), or when ii) X³ and X⁴ are different from each other, then either one of X³ and X⁴ is -NR¹³-), and the -NR¹³- is -NR^a- (R^a represents an acyl group derived from sulfonic acid) and the other is an oxygen atom, -NR¹³- (R¹³ represents a hydrogen atom, a hydrocarbon group optionally having substituent(s) or an acyl group optionally having substituent(s)), a sulfur atom or -CR¹⁵R¹⁶-).

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9. (Original) The phosphoric acid derivative according to claim 8, wherein the phosphoric acid derivative represented by the formula(la) is an optically active phosphoric acid derivative.

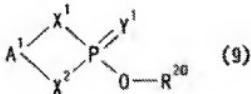
10. (Original) A phosphoric acid derivative represented by the formula (lb):



(wherein A² represents a spacer; and R²¹ to R²⁴ each independently represent a hydrocarbon group optionally having substituent(s) or a heterocyclic group optionally having substituent(s)).

11. (Original) The phosphoric acid derivative according to claim 10 wherein the phosphoric acid derivative represented by the formula (lb) is an optically active phosphoric acid derivative.

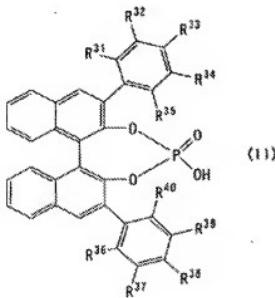
12. (Original) A phosphoric acid derivative represented by the formula (9):



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(wherein A¹ represents a spacer; X¹ and X² each independently represent a divalent nonmetal atom or a divalent nonmetal atomic group; Y¹ represents an oxygen atom or a sulfur atom; and R²⁰ represents an allyl group optionally having substituent(s) or a benzyl group optionally having substituent(s)).

13. (Original) A phosphoric acid derivative represented by the formula (11):

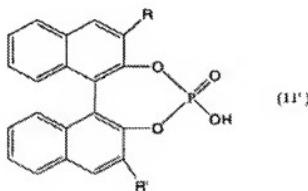


(wherein R³¹ to R⁴⁰ each independently represent a substituent other than an alkyl-substituted phenyl group; provided that at least one of R³¹ to R³⁵ and at least one of R³⁶ to R⁴⁰ are an aryl group optionally having substituent(s) (provided that an alkyl-substituted phenyl group is excluded)).

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14. (Currently amended) The phosphoric acid derivative according to claim 14-13,
wherein the phosphoric acid derivative represented by the formula (11) is an optically active
phosphoric acid derivative.

15. (Withdrawn) The process according to claim 1, wherein the phosphoric acid
derivative represented by the formula (1) is a phosphoric acid derivative represented by the formula
(11'):



(wherein R and R' the same or different represent a hydrogen atom, a bromine atom, an iodine atom, a methoxy group, a triphenylsilyl group, a naphthyl group, a phenyl group or a phenyl group having 1 to 3 substituent(s) (wherein the substituent is a substituent selected from a fluorine atom, a methoxy group, a methyl group, a tert-butyl group, a phenyl group, a trifluoromethyl group, and a naphthyl group)).

16. (Withdrawn) The process according to claim 1, wherein the nucleophilic compound
is an unsaturated heterocyclic compound represented by the formula (14):

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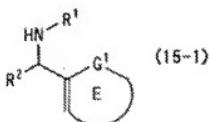


(wherein G^1 represents S or NR²⁶ (R²⁶ represents a hydrogen atom or a protective group); and ring E represents a monocyclic heterocycle having at least one double bond); or

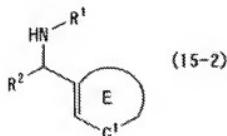
an unsaturated heterocyclic compound represented by the formula (16):



(wherein G^2 represents a heteroatom or a heteroatom; ring F represents a heterocycle having at least one double bond; and ring I represents an aromatic ring optionally having substituent(s) or a heterocycle optionally having substituent(s)); and the obtained amine is an amine represented by the formula (15-1):



and/or the formula (15-2):

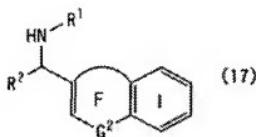


(wherein R^1 represents a hydrogen atom or a protective group;

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R^2 represents a group having no α -proton or an unsaturated hydrocarbon group; and ring E and G^1 are the same as defined above); or

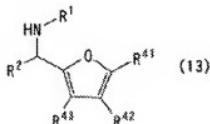
an amine represented by the formula (17):



(wherein R^1 represents a hydrogen atom or a protective group; R^2 represents a group having no α -proton or an unsaturated hydrocarbon group; and G^2 , ring F and ring I are the same as defined above).

17. (Withdrawn) The process according to claim 16, wherein the obtained amine is an optically active amine.

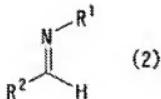
18. (Withdrawn) A process for producing an amine represented by the formula (13):



(wherein R^1 represents a hydrogen atom or a protective group; R^2 represents a group having no α -proton or an unsaturated hydrocarbon group; and R^{41} to R^{43} each independently

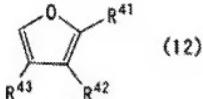
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represent a hydrogen atom or a substituent), which comprises reacting an imine compound represented by the formula (2):



(wherein R¹ represents a hydrogen atom or a protective group, and R² represents a group having no α-proton or an unsaturated hydrocarbon group)

with a furan represented by the formula (12):

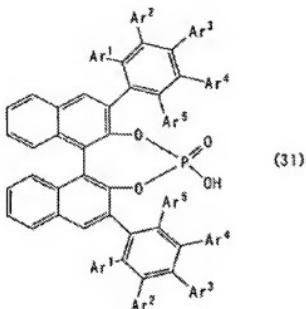


(wherein R⁴¹ to R⁴³ each independently represent a hydrogen atom or a substituent).

19. (Withdrawn) The process according to claim 18, wherein the obtained amine is an optically active amine.

20. (Original) A phosphoric acid derivative represented by:

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(wherein Ar¹ to Ar⁵ each independently represent a hydrogen atom or an alkyl-substituted phenyl group; provided that the case where all of Ar¹ to Ar⁵ are a hydrogen atom is excluded).

21. (Original) The phosphoric acid derivative according to claim 20, wherein the phosphoric acid derivative represented by the formula (31) is an optically active phosphoric acid derivative.

22. (Original) A catalyst for asymmetric synthesis, which comprises the optically active phosphoric acid derivative as defined in claim 9.